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ABSTRACT

Although some junior colleges and technical schools are creating or planning to offer training for solar-energy related occupations, there is no definitely defined need for workers with such training, according to this study. The study was conducted through a direct mailing of questionnaires about occupational projections to 472 companies identified as being involved in the "solar industry." Of this mailing, 102 questionnaires were returned and sixty usable responses (13%) were collected. A telephone follow-up to non-respondents indicated that the companies had only a passing interest in solar energy or that the market was too unstable to be able to predict the future. An analysis of the data indicated that (1) an emergence of new and specialized occupations across a solar industry will not occur in the near future; (2) of those firms listing employees as solar energy technicians, installers, or others, most were using existing trade persons, such as plumbers, as installers; (3) of those firms listing solar electrical technicians as a need, their responses were tied to future technical break-throughs. The study recommended that educators not invest additional dollars to establish solar training programs, but move to include solar installation and maintenance skills in training for heating and air conditioning, refrigeration, plumbing, or other related fields. (KC)

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AN OCCUPATIONAL DEMAND FOR SPECIALIZED SOLAR WORKERS: MYTH OR FANTASY?

1979

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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PRECIS

It is rare in the mundane area of occupational demand research to find out something that one did not originally set out to find. It is even more unusual to find something that is in direct contradiction to an initial bias. The typical designs for occupational demand research are basic and simple. Most build off of past data and leave little room for surprises. Yet this was not the case in this study of industrial needs for specialized solar workers. Not only was a useful sized demand not there --- I could not even find a solar industry.

This study did not have a research support group or a nationwide reputation from which to work. It was paid for in part with federal tax dollars via the Division of Vocational Education of the Kansas State Department of Education. The amount was small and without a doubt a better survey could have been conducted. I trust that others will conduct surveys and prove my findings incorrect. I re-examined and collected additional data for three months past the end of the project in hopes of discovering more agreeable data. It did not work.

The style and format of this publication is meant to encourage its readability. To a researcher, it will be lacking in detail. Please contact me if questions arise.

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BACKGROUND TO THE PROBLEM

The on-set of the energy shortage presented Americans with a new set of challenges (Greenfield, 1979; Simon, 1979). The summer of 1979 saw the long predicted energy riots, increased inflation and the possible suggested end of a political administration which some thought could not control, much less act, on the energy situation. Government, corporations and the institution of education have moved in various avenues with little coordination or any clear goals to solve or even identify the problems. The success has been slight for the amount of tax monies invested (Dubin, 1976; Lynch, 1979). Even what has occurred may not have always been well done.

Since the economics of energy became politically adjusted and other or out-of-country controlled in 1974, Americans have been through a variety of reactions (Steinhart, 1974; Butt, 1979). At first many did not believe that a shortage existed (Fisher, 1974), or thought it was a good idea for the environment not to have fossil fuels anyway (Fowler, 1975). The T.V. mentality of the time, "when gasoline gets to 50¢ a gallon, there will be all that we can buy," basically set the policy for the 1974 to 1979 period. Good energy economics seemed to be bad politics. It looked like it was going to work, paying more, except just paying more proved to the Mediterranean groups that Americans

would pay! The same approach worked in 1979 with the price increase, "when gasoline gets to $1.00 a gallon.....etc." The passive approach of Americans to the oil situation has set the stage. The stage has been tested and will be used again.

Some Americans took the crisis seriously and began to attempt to understand the difficult system of finance, politics and personalities which put energy in its strange situation (Healy, 1974). Some took another track and just attached the phrase "energy-saving" on their products and concepts. Still others returned to the technology of the past in the hope of solving problems and making money (Clegg, 1975).

One of those items of the past, besides the fireplace, was solar heating of space and water. Solar heating was attractive to many Americans. They could see themselves developing an efficient system and saving the world. For most, except the true tinkerer, it proved to be hard work so they went back to the T.V. and beer on weekends rather than the drawing board and work room (Sheils, 1979; Lynch, 1979). A few helpful agencies generated such research titles as Potential Environmental Impacts of Solar Heating and Cooling Systems (Consroe, 1976).

Somewhere in the time frame of 1974-80, the institution of vocational and technical education, which is so use to being mandated to attacking social problems, began to decide that a brand new industry was developing and a solar technician would be the new occupation of the future. One is unsure as to how vocational and technical educators arrived at such a conclusion.

Perhaps it was all of those, $200.00 a day plus expenses, speakers at professional meetings telling us how many thousands of solar workers were going to be needed by 1984. How about political aspirations

relating how many would be needed if we bought their energy plan. Take the following article as an example. The title is, "Who will be Working in Solar Energy Jobs?" It was co-written by Mary Schiflett, who is the Director of Publications for the Energy Laboratory and senior research associate of the Institute of Labor and Industrial Relations at the University of Houston, Central Campus. The other writer was Dr. John V. Zuckerman, a professor of management in the College of Business Administration on the same campus. The article was published in the May, 1979 issue (Vol. 4, No. 3) of Solar Engineering Magazine. The magazine notes on its cover that it is the official publication of the Solar Energy Industries Association. Both the association and the magazine publication firm are housed in Dallas. This was one of the few magazines that was actually delivered. Several were subscribed to during the conduct of this study. The authors are respectable and the magazine has a good appearance.

Some of the data in this 1979 article had a 1975 base. The 1975 data by the National Science Foundation and the Bureau of the Census indicated that only 1% of the 186,000 energy engineers and technicians were in solar work. However, they quoted Wilson Clark, an energy adviser in California (no other credentials listed), saying, "solar will be a $4 to $7 billion industry with a labor force of 50,000 by the late 1980s". The article goes on to quote some union leaders who give even less documentation. An insert in the article points out that Meg Schacter, Consultant to the Department of Energy, Policy and Evaluation, Advanced Energy Systems Policy Division (what is it) lists some facts that indicate "solar creates two to eight times as many direct jobs as conventional power plants." While pondering what that meant, this writer reviewed the last paragraph of the article:

> In the United States, 12 million new jobs are needed nationwide over the next five years to reach a pre-1973 level of employment and unemployment percentages. As researchers make further refinements in the use of solar energy, the solar industry will begin to fulfill this need as a major employer.

It is easy to see how one who is not trained in evaluating literature or is pushed by enthusiasm to find something to back up their belief that solar education is needed, could use such an article as firm documentation. There are other motives. Read the quote again. It is very misleading.

There are many institutions at the post-secondary level which are still facing the possibilities of closing their doors or having their staff significantly reduced. Their leaders are making several valiant efforts to keep their programs going until enrollment declines stabilize. The addition of a solar technician program sounded very useful to the status-conscious and enrollment-falling junior colleges in the United States. Not to be left out, area vocational and technical schools started adding components in solar, and Comprehensive Education Training Act (CETA) programs set up special projects.

A review of those programs from the literature, selected visitations and course listings has brought some seed observations. Some were not in keeping with good occupational training programs. That is not the case for all. However, there was one CETA solar program that was teaching Mexican-Americans to shovel rocks. Whether rock was the best storage system per cost was not the issue. Just shovel the rock! Some post-secondary institutions pieced together an associate degree out of science, general education and a reading course in solar. Some schools had air conditioning and refrigeration programs operating. The conversion or dual course was easily made in those cases. The file base for

this paper even includes a sun yellow brochure from a public junior college describing their associate degree as a solar technician and their anticipated solar unit and anticipated building.

Regardless of the charades there was still the question, "Are there jobs, skilled jobs, in solar?" Another way to state the issues:

(1) Is there a solar industry of sufficient size to justify mass training?
(2) Are there skilled new jobs which require specialized and lengthy (up to two years) specialized training?
(3) Is there a sufficient body of unique and transferable information to support new training programs?

So much to decide with so little.

PROBLEM STATEMENT

Several levels and types of educational agencies are currently offering, or are considering to offer, new classes, courses and programs to train individuals for varying levels of emerging occupations in the solar space and water heating business. Based on a review of some literature, industrial reports and observation of on-going programs, it seems reasonable to address the issue of whether or not the needs of a true solar industry exist at a level which can compete for training tax dollars and without a doubt offer real present and future job opportunity. Concommital to that, but not under investigation in this study, is the existence or non-existence of a unique body of knowledge concerning solar heating.

To those ends described, this study is dedicated. The design is not as unique as the issues addressed.

DESIGN OF DATA COLLECTION

The procedure was a very basic, well-tried occupational forecasting method. Its direct contact with employers, without inference ability or other types of generalization, makes the approach one of the least controversial in use when working with a small population (Kerlinger, 1973). In addition, direct-mail is economical and is a method understood by experts and lay persons alike. Further, they are used to its weaknesses and strengths.

Several address lists were collected and reviewed. As in all cases, one is never satisfied with a mailing list. Two lists (Carolyn Pesko, 1977; Ann Arbor Science Publishers, Inc., 1977), were selected based upon reputation of developer, presentation of a nationwide group of addresses and an internal grouping of addresses (i.e. manufacturers, designers, etc.). In each list all addresses listed under builders, installers, manufacturers and designers were copied. Duplications were removed and a final mailing list of 472 addresses was identified as the nationwide population.

A one-page occupational survey instrument was designed. After various critiques, twenty-two occupations or jobs were identified. These ranged from semi-skilled through engineers. Two are not to be considered as well-defined jobs--research engineer and solar energy installers. Neither was defined in the instrument. A space for "others" with the following comment was listed, "Please list different or new and emerging jobs unique to the solar business not listed elsewhere." The instrument had the address placed very obviously in the upper left-hand corner. The name and title of the completer was asked for and a request to place the company in one or more of the four categories of

designing, manufacturing, installation or maintenance was made. A copy of the instrument is in Appendix A. A cover letter (Appendix B) and an imprinted postage-free addressed return envelope was included. The instrument requested a current number of employees and number to be added or substracted in three years and five years.

RETURNS, FOLLOW-UPS AND DATA ASSEMBLY

Four hundred and seventy-two instruments were mailed. Four were returned undelivered. One follow-up was conducted. Of the four hundred and sixty-eight remaining, one hundred and two were eventually returned (twenty-one percent). Of the one hundred and two returns, forty-two were not usable. Of these forty-two unusable returns, seven would not provide information, twenty stated the survey did not apply to their activities, four had no employees, four returned the forms with no responses, and seven returned the forms with various reasons for non-completion. Thus, of the four hundred and sixty-eight addresses, sixty usable responses were collected (thirteen percent).

DATA REFLECTION

The data from one return was removed during the data assembly period. The firm was going to move from fifteen employees in 1979 to ten thousand and two hundred and forty-five by 1985. Upon follow-up, the president did offer to sell this writer a franchise for $50,000.00. Upon declining the offer, it was pointed out that for $8.95 plus tax and postage, a cassette tape on the subject would be forwarded.

Table I reflects the final untreaded data. Because of the return rate, the responses by type of business; designing, manufacturing,

installation and maintenance were tabled together in Table I. A death and retirement factor was not determined and added to the projected data as is common in most forecasts.

Attention is directed to the job listed as solar energy installers. Most of these installers were projected by firms which marketed solar hot water heaters. Hand written comments indicated that plumbers were doing the installation or that for larger commercial projects that a "generalist" was required. The generalist was described as one familiar with design, engineering and installation. The solar specification writer was noted by two different designing firms. The solar electrical technician number was generated by one company in the photovoltaic field. A follow-up indicated that the number is dependent upon future technical break-throughs.

A follow-up of a selected sample of non-respondents generated the following comments by telephone.

> "Too many variables effect solar at this time."
> "We are primarily in (another business) and have only accomplished a little work in solar."
> "All employees we have do about the same thing."
> "Solar is not full-time employment, only flexible assemblies as required for solar installation."
> "Due to the unpredictable nature of the solar market, we hesitate in making any definite statements regarding the size of company solar activities in the future."

The mailing lists used to develop the population, did mostly contain companies which at one time or another had some solar activities. The major reason for non-responding was the unstable nature of the market in the future. Whether the phone follow-up was random is not known. It did, however, because of the commonality of responses seem to be possibly representative of the population.

TABLE I

FINAL UNTREATED DATA OF

SOLAR INDUSTRY FORECAST

1979-1985

	NUMBER CURRENTLY EMPLOYED 1979	NUMBER TO BE ADDED OR SUBTRACTED BY 1982	NUMBER TO BE ADDED OR SUBTRACTED FROM 1982 TO 1985
ENGINEERS			
ELECTRONIC	52	26	53
ELECTRICAL	9	8	7
CIVIL	9	4	6
MECHANICAL	88	62	53
RESEARCH	68	43	34
ARCHITECTURAL	20	13	12
STRUCTURAL	7	6	16
DRAFTER	35	45	63
ASSEMBLERS-PRODUCTION LINE	977	783	1038
INSULATION WORKER	19	11	13
SPECIALIZED GLASS WORKERS	9	70	122
PAINTERS	8	25	31
SPECIALIZED METAL WORKERS	70	152	264
INSTALLERS			
CARPENTERS	3	4	4
PLUMBERS	3	2	3
ELECTRICIANS	1	1	0
HEATING AND AIR CONDITIONING	6	7	8
SHEET METAL WORKERS	10	10	3
SOLAR ENERGY INSTALLERS	26	72	167
OTHERS: (i.e. CONSTRUCTION MANAGERS, QUALITY CONTROL, ETC.)	25	48	86
OTHERS: NEW & EMERGING			
SOLAR SPECIFICATION WORKERS	2	0	0
SOLAR ELECTRICAL TECHNICIAN	12	+20	+30
TOTAL	1459	1408	2013

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The following findings are based in part on what was not reported initially by the populations. Knowing what was not there was part of the original intent of the study.

1. Of those firms reporting, the emergence of new and specialized occupations across a solar industry will not occur in the near future.

2. Of those firms not responding to the mail-outs, but being followed-up by telephone, most were not heavily involved in a solar industry or had only a passing interest in solar.

3. Of those firms responding to the mail-outs and follow-up calls, the sizable majority cited the unstable nature of the solar market as the main reason for not planning to expand their efforts greatly.

4. Of those firms responding to the mail-outs and listing employees as solar energy technicians, installers or others, most were using existing trade persons, such as plumbers as installers.

5. Of the firm responding to the mail-out and listing solar electrical technicians as a need, their responses were tied to future technical break-throughs.

Conclusions are simple to state at this point.

1. Based on the findings, there is not a sizable grouping of firms which could be considered a solar industry in the same fashion as we speak of a construction, communication or housing industry.

2. Based on the findings there is not a sizable group of specialists who require training as solar technicians or solar workers.

3. Based on the findings solar related work is being handled in industry by related trades.

Recommendations obviously include additional research. Decision-makers in education should not invest additional dollars to establish new and specialized solar training programs. Nor should students be allowed to major or specialize in such an area. Decision-makers should move, however, to include solar installations and maintenance skills

in heating and air conditioning, refrigeration, plumbing or other related fields.

DEFENSE OF THE STUDY

A paper of this nature will and rightly should draw criticism. It presents items which strongly question the judgments of many people who have already invested dollars in new programs. A major item which will be pointed as a weakness of the study is the low return rate of the mail-out instrument. That is, as documented by follow-up calls, a strength of the study. It supports the conclusion of the absences of a solar industry. Most industries are not bashful about demanding training from education. The demand is not there, nor does it appear to be on the horizon.

The entire design of the study is basic. It is not sophisticated or new. It does work and has worked for several decades. Given the limits of the budget, it was a clear choice.

Some will indicate that this study is against solar training. That is far from the reality. This survey states that training should occur in related trades and there is insufficient evidence to support the development of specialized programs. The skills appear simple.

The findings of this study are generally the same as one completed in 1976 by Contract Research Corporation of Belmont, Massachussetts. It was done for the Bureau of Occupational and Adult Education of the U. S. Office of Education. They reflected insufficient demand and lack of predicated growth to merit curriculum development in the solar technician field. The title of the document is Identifying and Planning for New and Emerging Occupations.

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APPENDIX A

NATIONAL OCCUPATIONAL FORECASTING SURVEY OF VOCATIONAL, TECHNICAL AND ENGINEERING LEVEL JOBS IN THE DISIGNING, MANUFACTURING, INSTALLATION AND MAINTENANCE AREAS OF SOLAR SPACE AND WATER HEATING UNITS.

Please Check the type(s) of activities your company performs.

DESIGNING_____

MANUFACTURING_____

INSTALLATION_____

MAINTENANCE_____

YOUR NAME_____

TITLE_____

IF YOUR COMPANY IS IN MANUFACTURING PLEASE SPECIFY THE ITEM(S) MADE_____

LISTED BELOW ARE SIXTEEN PROJECTED OCCUPATIONS. FOR THOSE YOU EMPLOY IN THE SOLAR FIELD PLEASE LIST THE NUMBER CURRENTLY EMPLOYED IN COLUMN 1, THE NUMBER OF NEW ADDITIONS OR SUBTRACTIONS DURING THE NEXT THREE YEARS IN COLUMN 2, AND THE NUMBER TO BE ADDED OR SUBTRACTED FROM 1982 TO 1985 IN COLUMN 3.

	NUMBER CURRENTLY EMPLOYED 1979	NUMBER TO BE ADDED OR SUBTRACTED BY 1982	NUMBER TO BE ADDED OR SUBTRACTED FROM 1982 TO 1985
ENGINEERS			
ELECTRONIC			
ELECTRICAL			
CIVIL			
MECHANICAL			
RESEARCH			
ARCHITECTURAL			
STRUCTURAL			
DRAFTER			
ASSEMBLERS-PRODUCTION LINE			
INSULATION WORKER			
*SPECIALIZED GLASS WORKERS			
PAINTERS			
*SPECIALIZED METAL WORKERS			
INSTALLERS			
CARPENTERS			
PLUMBERS			
ELECTRICIANS			
HEATING AND AIR CONDITIONING			
SHEET METAL WORKERS			
SOLAR ENERGY INSTALLERS			
OTHERS (Please list different or new and emerging jobs unique to the solar business not listed elsewhere.			

* Please identify by title or major activity.

APPENDIX B

Pittsburg State University
75 Years
Pittsburg, Kansas 66762
316-231-7000

Dear Resource Person:

Please HELP us plan future vocational, technical and engineering training programs. In order to conduct sound curriculum planning in the solar energy field, we need the direct advice of individuals like yourself. Attached is a short survey asking for your current and projected job demands for specified skill levels in the solar field. This covers designing, manufacturing, installation and maintenance.

The information you provide will be compiled with others from across the nation. All data will remain confidential and no information on any one company will be released. A final report on the nation-wide survey will be issued. If you desire a copy of the final report please note such on the survey form. A franked envelope is enclosed for your convenience. If you do not want to participate please return the items in the franked envelope with a note. This will save postage and time on any follow-up we might run.

Thank you for your efforts for education. If I may be of service in any way, please contact me.

Sincerely,

William Gary Ward

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